

0977203-020501

Mode	Data rate (Mbps)	Target application	Receiver sensitivity	Power consumption ('2001)	
				Rx. average	Tx. average
Mode 1.0 (Bluetooth)	1 Mbps		-84 dBm	25 <i>mW</i>	15 <i>mW</i>
Mode 2.0	2.6-3.9 Mbps	Audio	-78 dBm	30 <i>mW</i>	20 <i>mW</i>
Mode 3.0	22-44 Mbps	Video, computer graphics	-69 dBm	95 <i>mW</i>	60 <i>mW</i>

Figure 1

0977203-02094

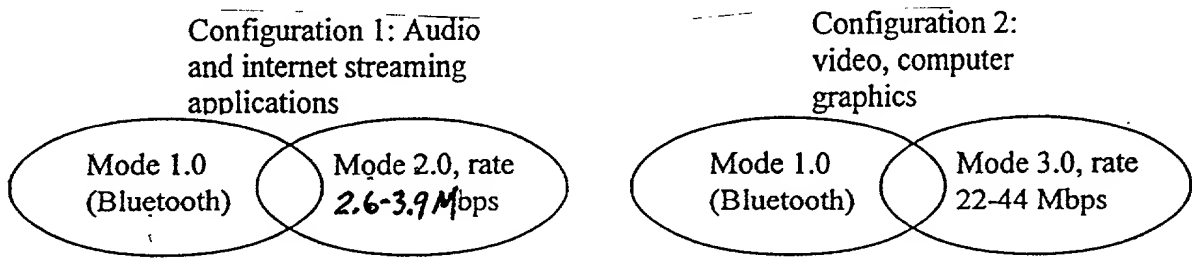


Figure 2

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Parameters	Mode 1 (Bluetooth)	Mode 2
Frequency hopping	1600 Hz	Same as Bluetooth
Filter spectrum		Same as Bluetooth <del>1600 Hz</del>
Modulation	GFSK	16, 64 QAM
Maximum data rate	1 Mbps	2.6, 3.9 Mbps
Acquisition		Using mode 1 then switch to mode 2
Transmit power	0 dBm	0 dBm, 6 dBm
Distance	10 m.	10 m.
Nominal packet error rate	10 %	10 %
Margin + Noise figure	37 dB	37 dB
Receiver sensitivity	-84 dBm	-84, -78 dBm
Coding	ARQ	ARQ + convolutional code across packets

Figure 3

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TDS020-ED24460

Frequency offset	Transmit power
+/- 550 kHz	-20 dBc
$ M-N  = 2$	-20 dBm
$ M-N  \geq 3$	-40 dBm

Figure 4

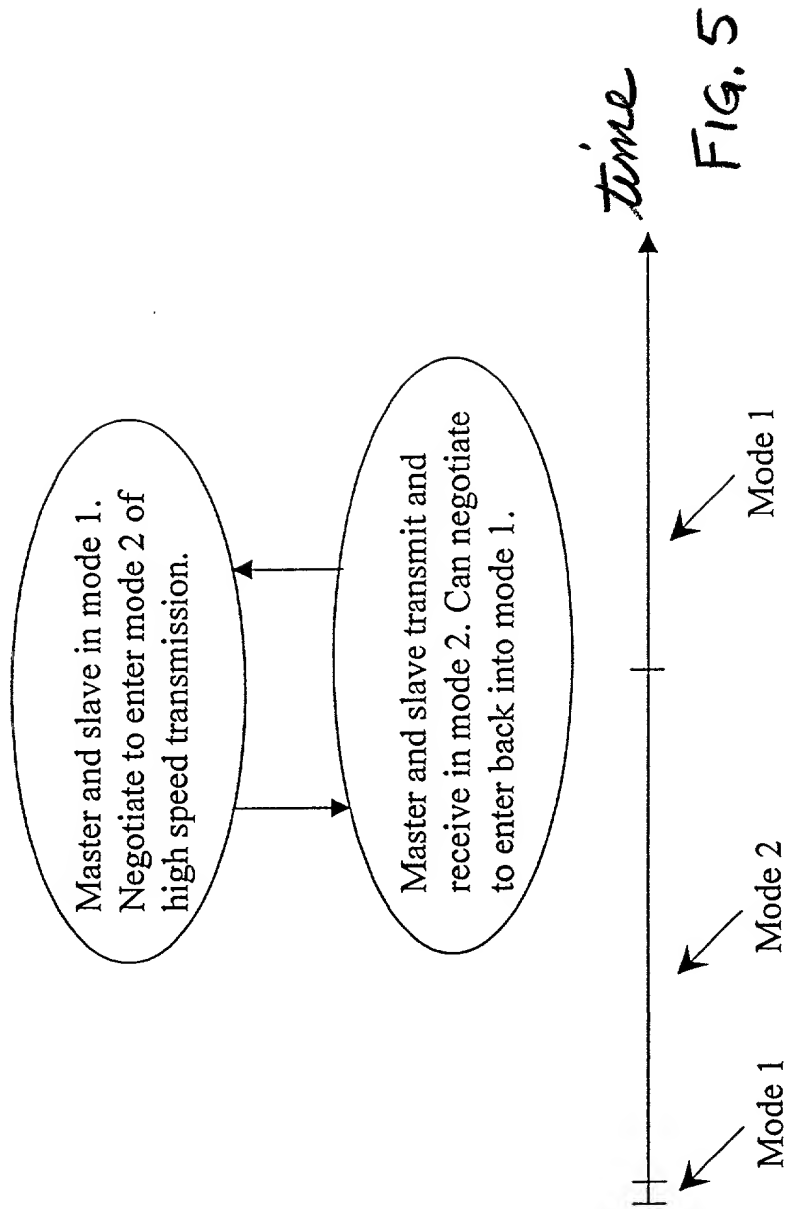


FIG. 5

T05020 "E02260

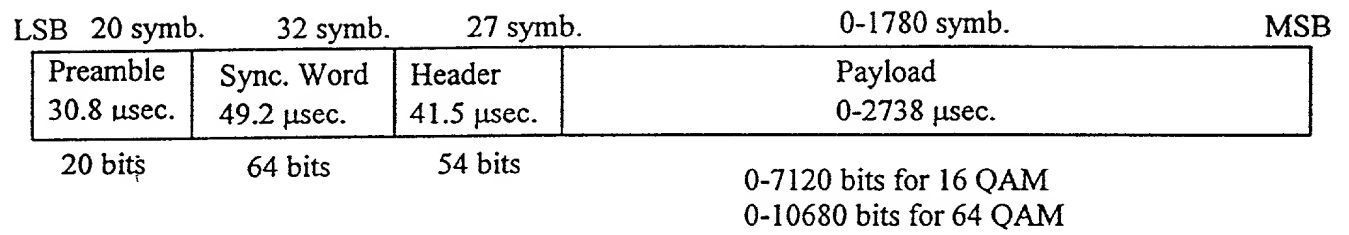


Figure 6

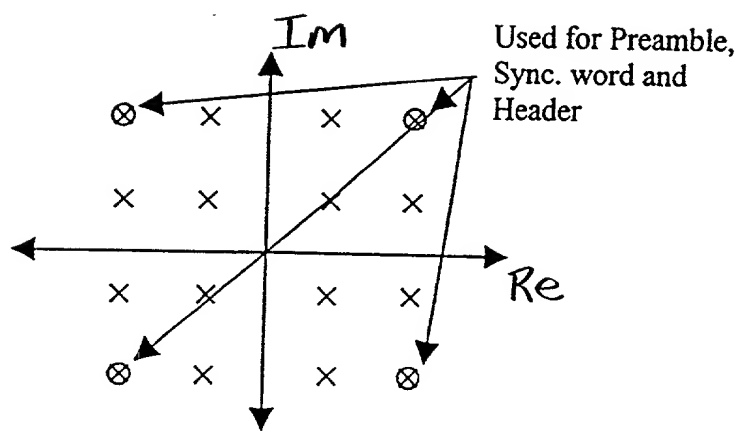


Figure 6A

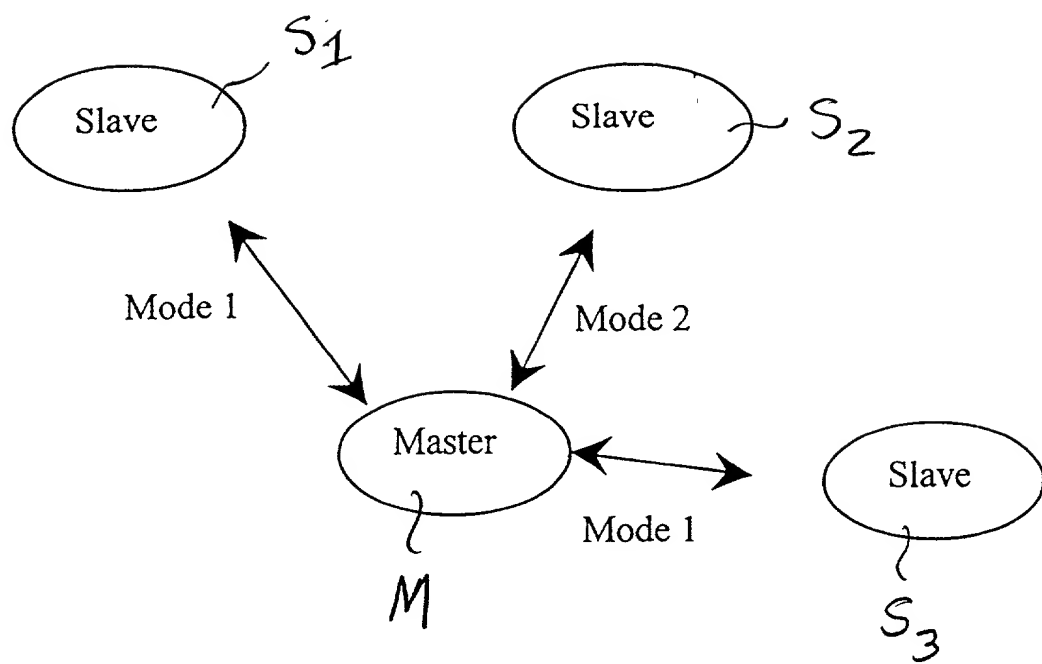


Figure 7



105020" 0027768

M	S <sub>1</sub>	M	S <sub>2</sub>	M	S <sub>3</sub>	M	S <sub>1</sub>	M	S <sub>2</sub>	M	S <sub>3</sub>
Mode 1	Mode 1	Mode 2	Mode 2	Mode 1	Mode 1	Mode 1	Mode 1	Mode 2	Mode 2	Mode 1	Mode 1

*time* →

Figure 8

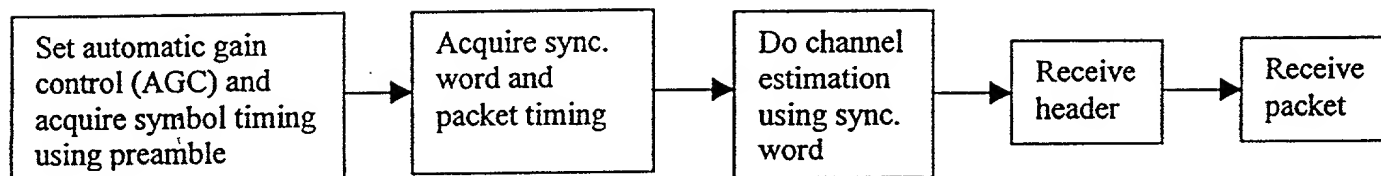


Figure 9

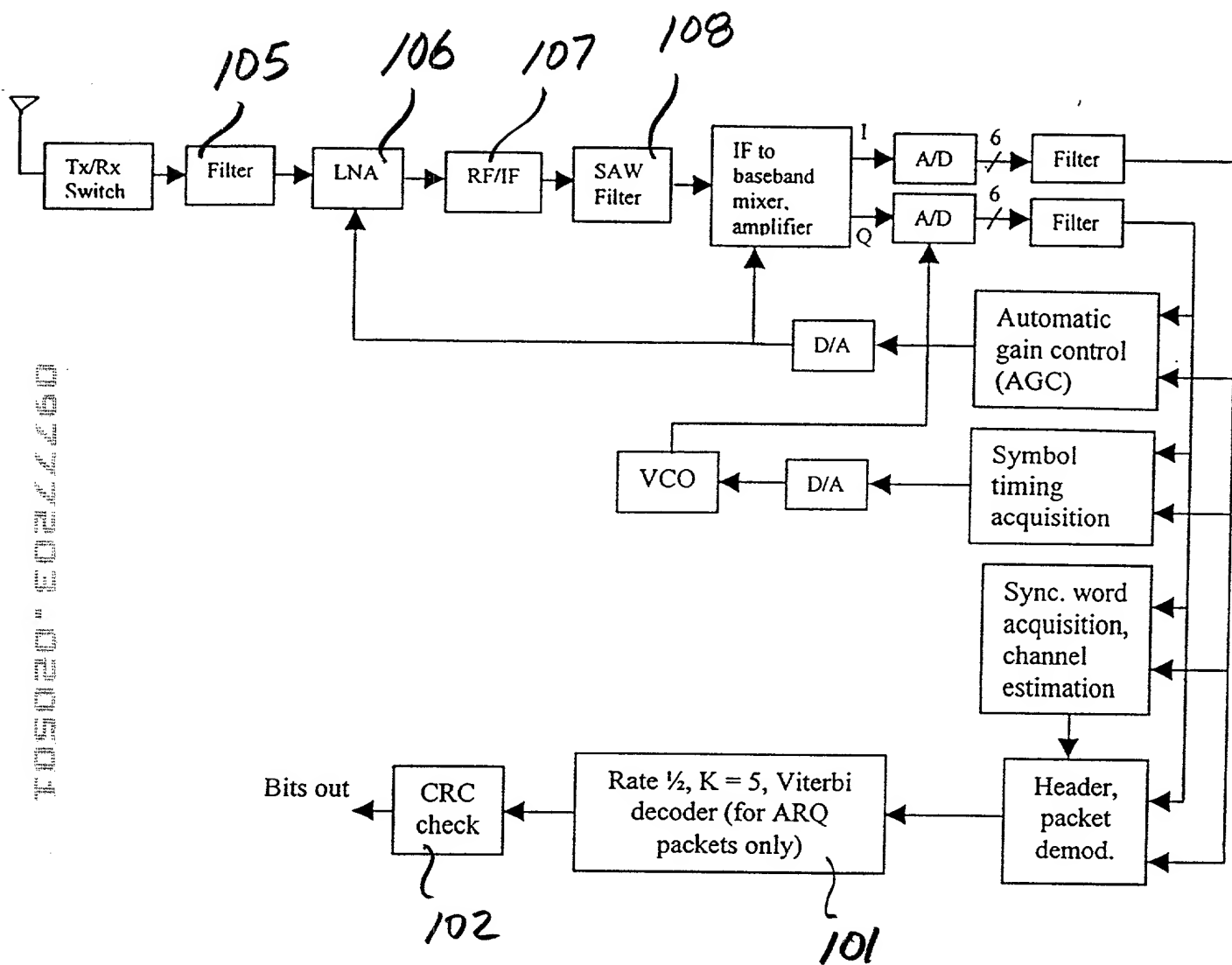


Figure 10

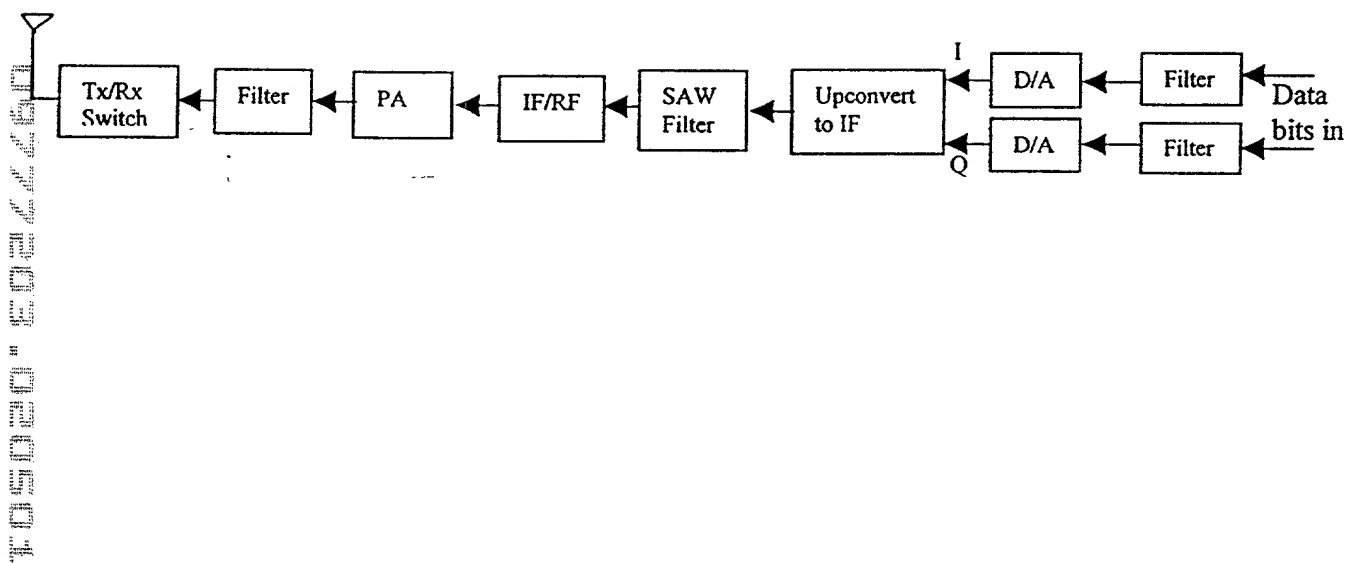


Figure 11

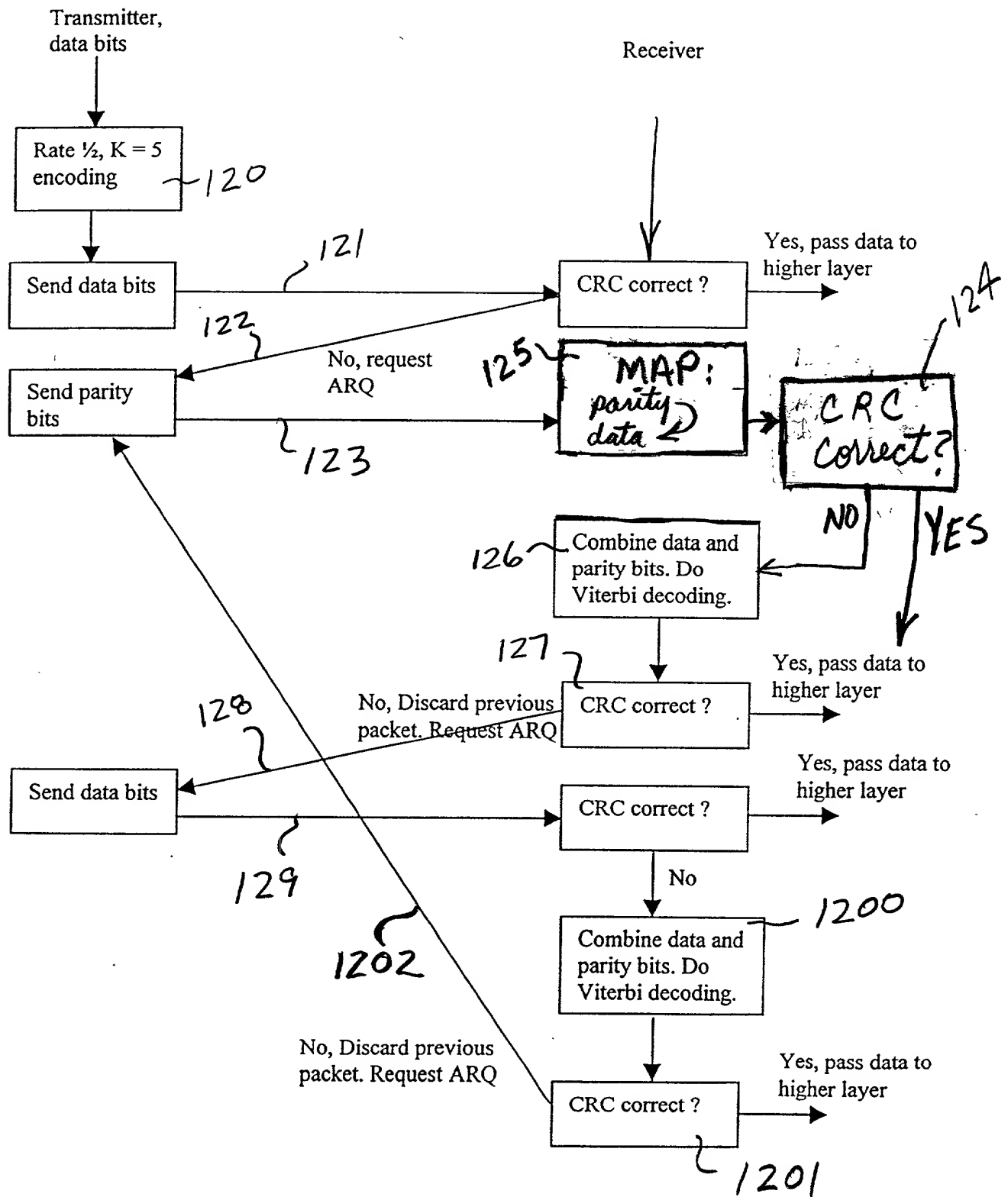


Figure 12

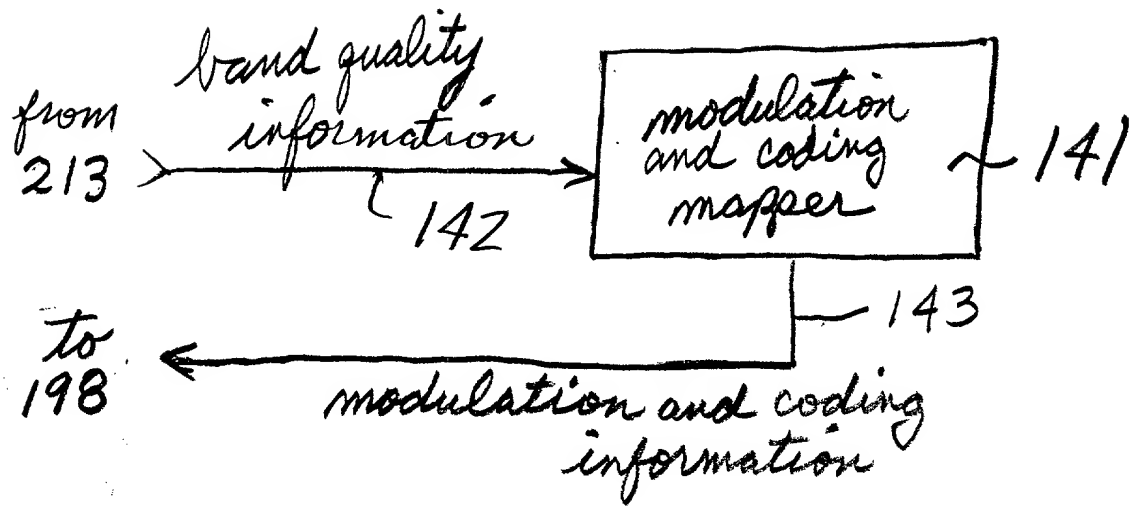


FIG. 14B

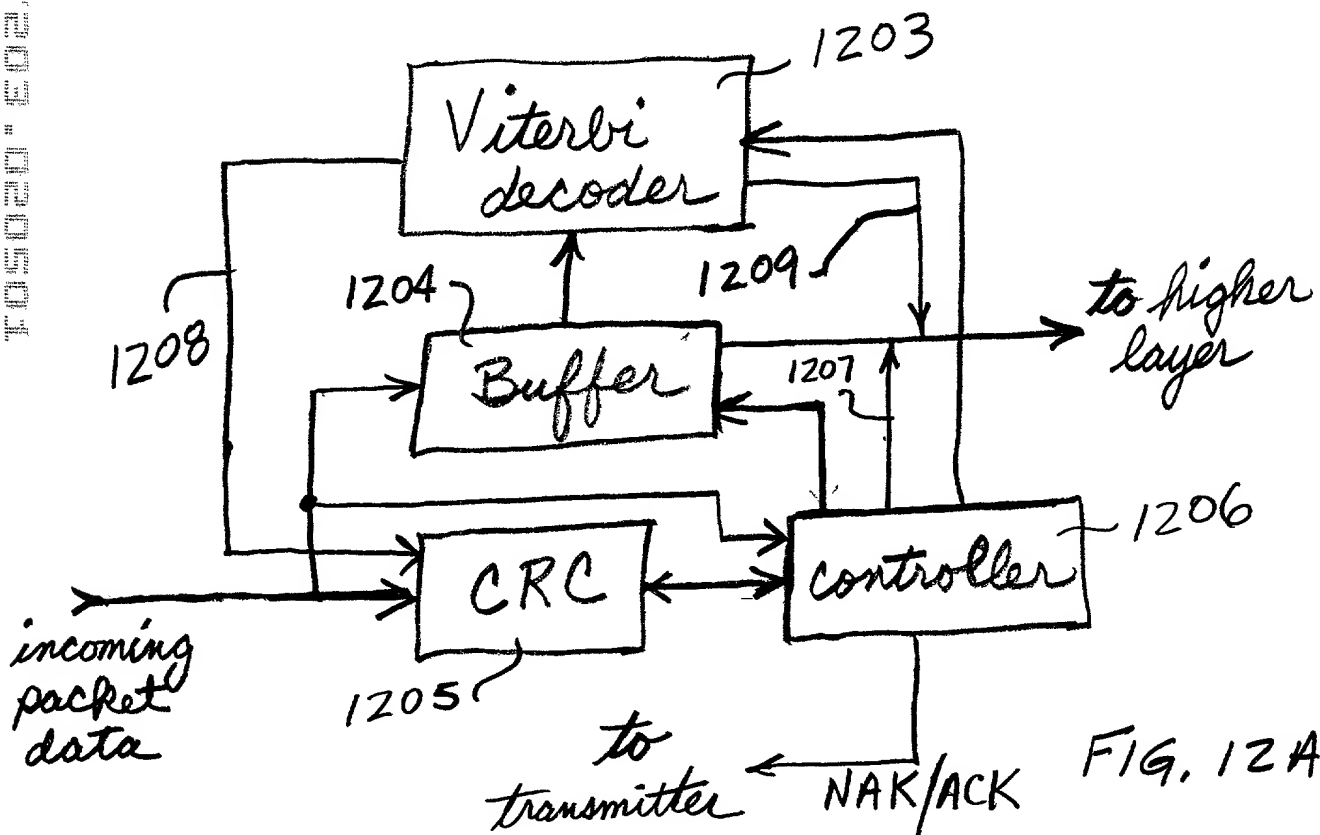


FIG. 12A

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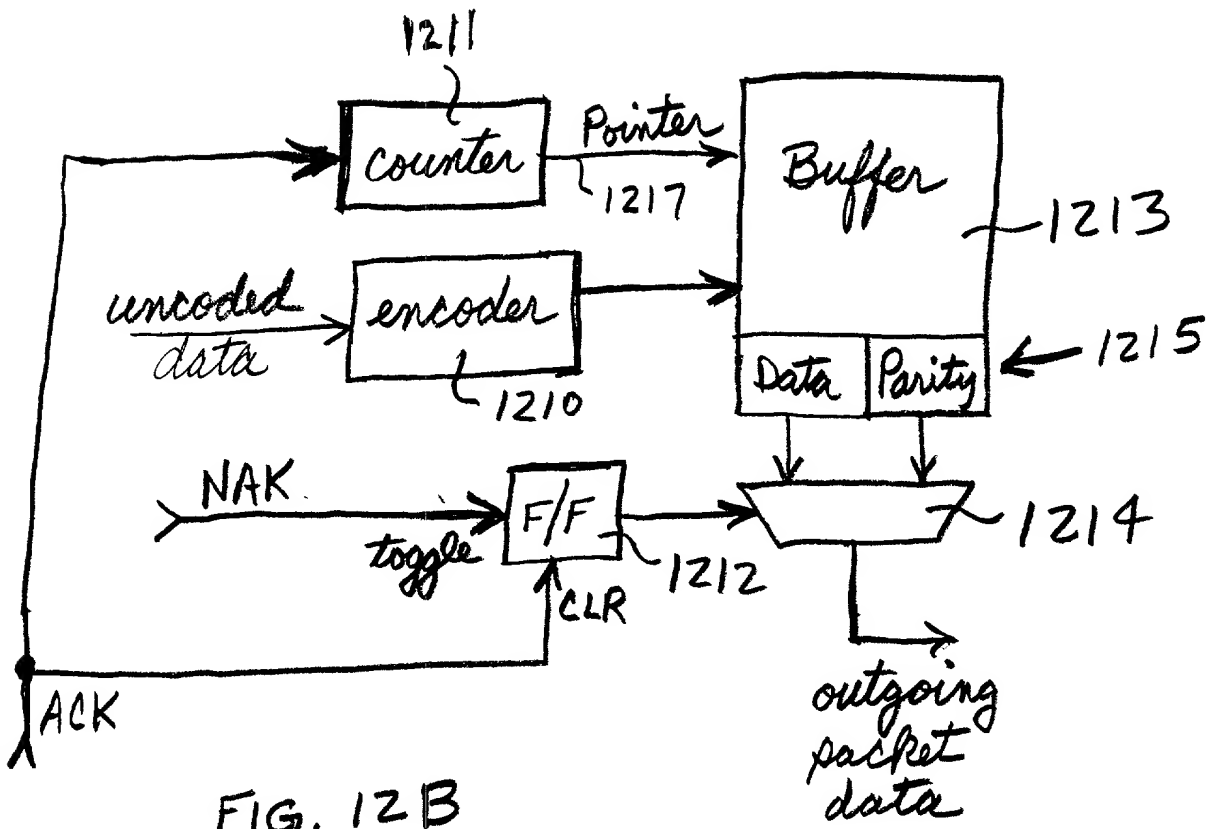


FIG. 12B

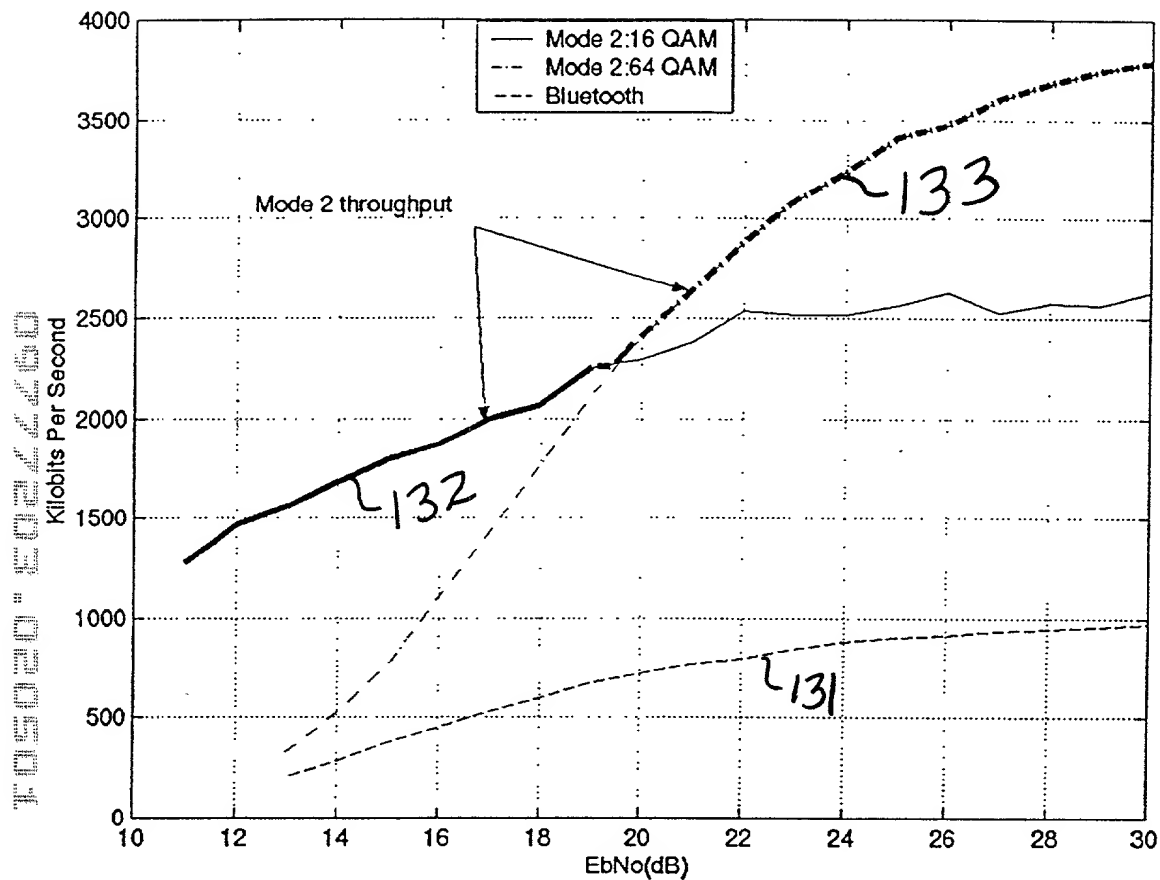


Figure 13



Parameters	1	2	3	4	5
Filter spectrum	802.11b	802.11b	802.11b	802.11b	802.11b
Modulation	QPSK	QPSK	16 QAM	16 QAM	16 QAM
Scrambling code length	256	256	256	256	256
Physical data rate	22 Mbps	22 Mbps	44 Mbps	44 Mbps	44 Mbps
Coding	Rate 1/2, Turbo (SCCC)	None	Rate 1/2, Turbo (SCCC)	Rate 3/4, Turbo (SCCC)	None
ARQ	Optional	Optional	Optional	Optional	Optional
Maximum data rate	11 Mbps	22 Mbps	22 Mbps	33 Mbps	44 Mbps
Transmit power	-1 dBm	8 dBm	4 dBm	8 dBm	15 dBm
Distance	10 m.	10 m.	10 m.	10 m.	10 m.
Bit error rate	1e-8	1e-8	1e-8	1e-8	1e-8
Packet error rate	1e-4	1e-4	1e-4	1e-4	1e-4
Margin+Noise figure	37 dB	37 dB	37 dB	37 dB	37 dB
Receiver sensitivity	-85 dBm	-76 dBm	-80 dBm	-76 dBm	-69 dBm
Frequency diversity	Band selection	Band selection	Band selection	Band selection	Band selection
SYMBOL RATE	11 Msps	11 Msps	11 Msps	11 Msps	11 Msps
SPREADING	11 Mcps	11 Mcps	11 Mcps	11 Mcps	11 Mcps

Figure 14

	Max. data rate	Modulation	Symbol rate	Coding	Spreading
18	18 Mbps	QPSK	18 Msps	rate 1/2	18 Mchips/sec
19	36 Mbps	QPSK	18 Msps	rate 1	18 Mchips/sec
20	36 Mbps	16 QAM	18 Msps	rate 1/2	18 Mchips/sec
21	54 Mbps	16 QAM	18 Msps	rate 3/4	18 Mchips/sec
22	72 Mbps	16 QAM	18Msps	rate 1	18 Mchips/sec

FIG. 14A

Parameters	6	7	8	9	10
Filter spectrum	802.11b	802.11b	802.11b	802.11b	802.11b
Modulation	QPSK	QPSK	QPSK	QPSK	QPSK
Scrambling code length	256	256	256	256	256
Physical data rate	22 Mbps	22 Mbps	22 Mbps	22 Mbps	22 Mbps
Coding	Rate 1/2, Turbo	Rate 2/3, Turbo	Rate 3/4, Turbo	Rate 4/5, Turbo	Rate 5/6, Turbo
ARQ	Optional	Optional	Optional	Optional	Optional
Maximum data rate	11 Mbps	14.67 Mbps	16.5 Mbps	17.6 Mbps	18.33 Mbps

FIG. 14C

105020 " 0022460

Parameters	11	12	13	14	15	16	17
Filter spectrum	802.11b	802.11b	802.11b	802.11b	802.11b	802.11b	802.11b
Modulation	8-PSK	8-PSK	8-PSK	8-PSK	8-PSK	8-PSK	8-PSK
Scrambling code length	256	256	256	256	256	256	256
Physical data rate	33 Mbps	33 Mbps	33 Mbps	33 Mbps	33 Mbps	33 Mbps	33 Mbps
Coding	None	Rate 1/3, Turbo	Rate 1/2, Turbo	Rate 2/3, Turbo	Rate 3/4, Turbo	Rate 4/5, Turbo	Rate 5/6, Turbo
ARQ	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Maximum data rate	33 Mbps	11 Mbps	16.5 Mbps	22 Mbps	24.75 Mbps	26.4 Mbps	27.5 Mbps

FIG. 14D

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Frequency offset	Transmit power
$f_c$	0 dBc
+/- 11MHz	-30 dBc
+/- 22 MHz	-50 dBm

Figure 15

FOUO "FOUO" FOUO

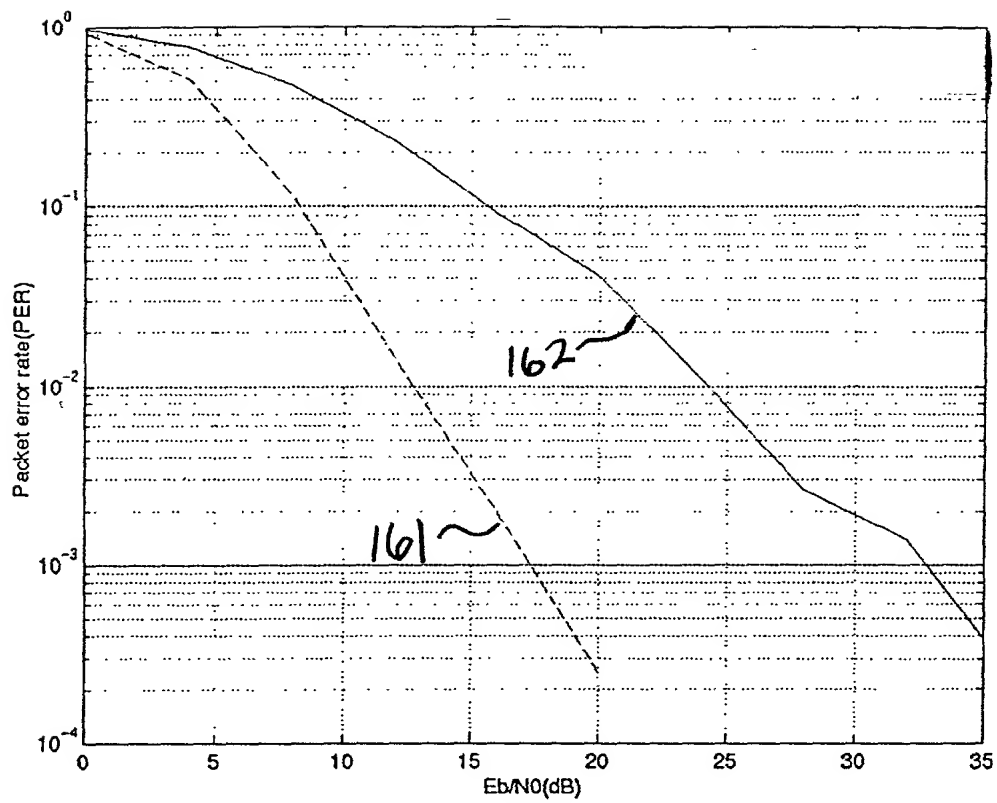


Figure 16

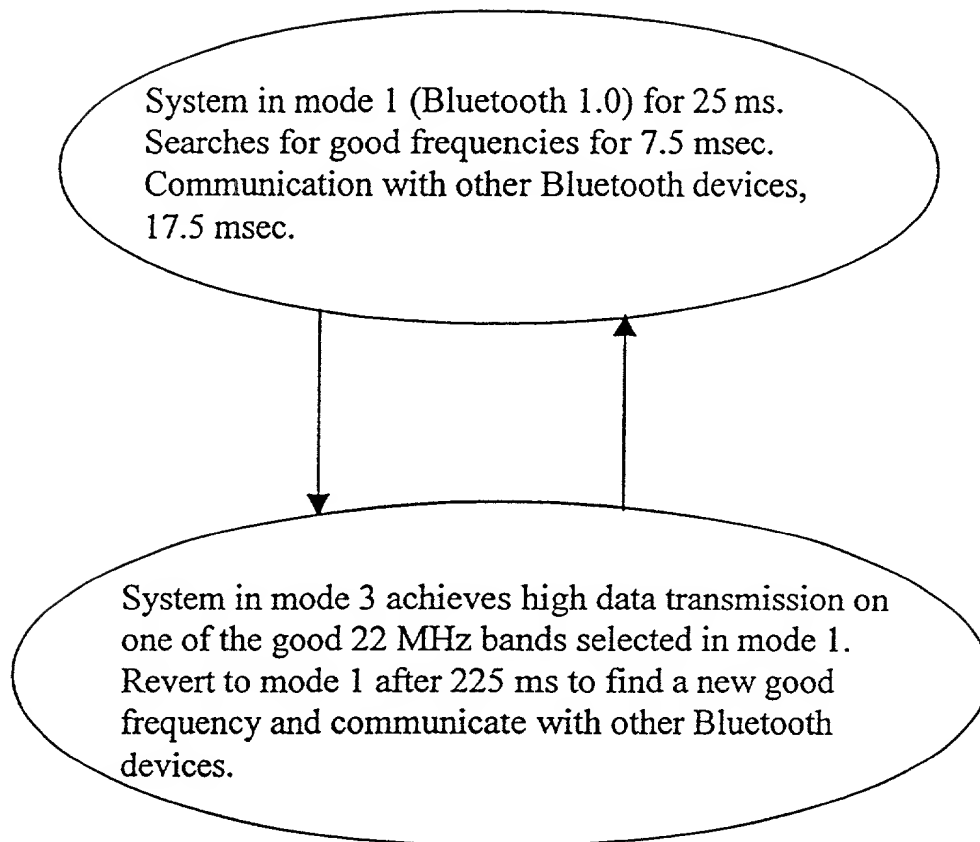


Figure 17

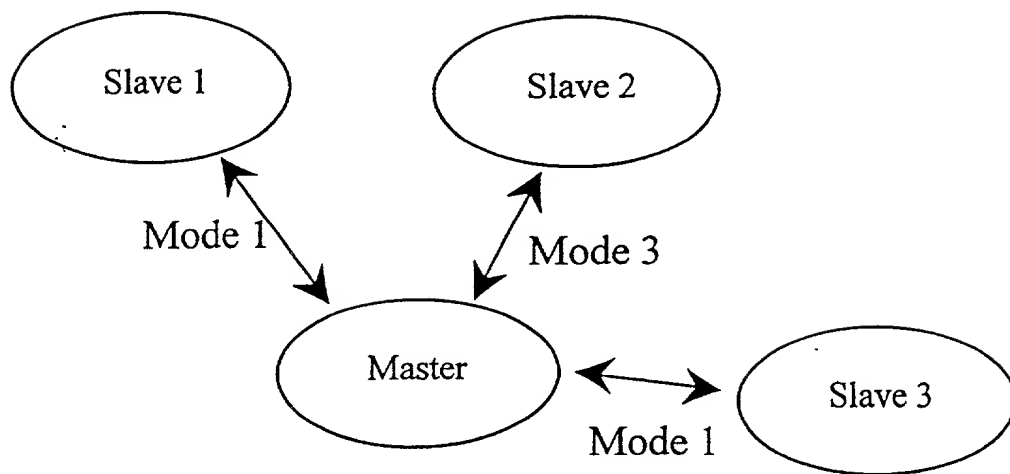


Figure 18



0977203-030501

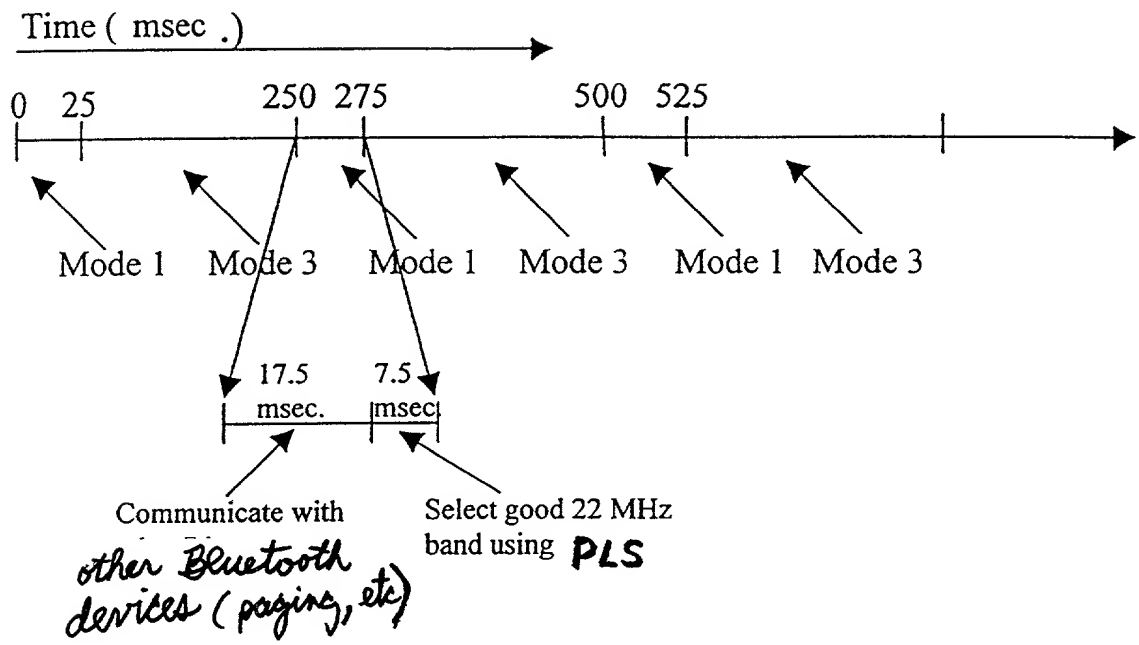
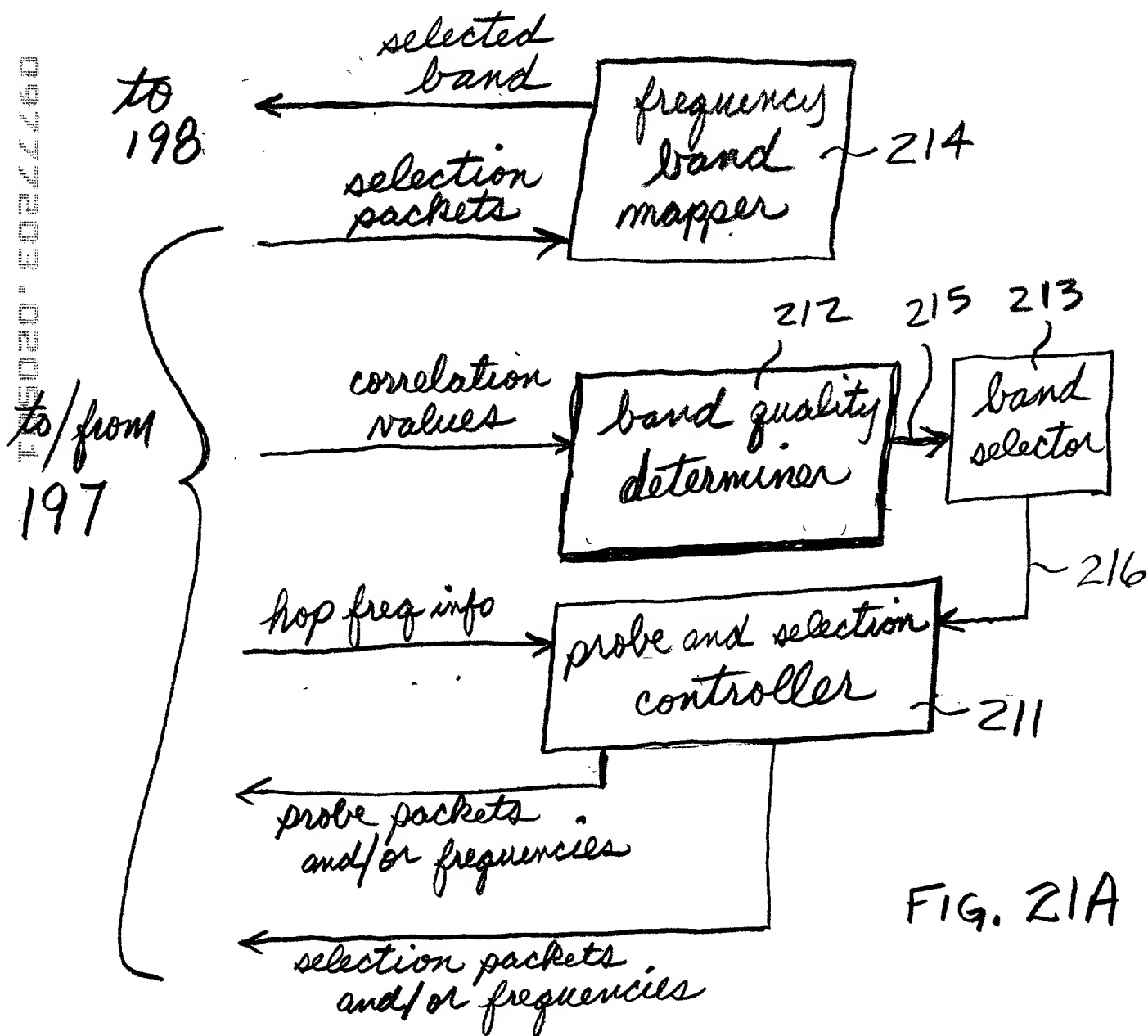
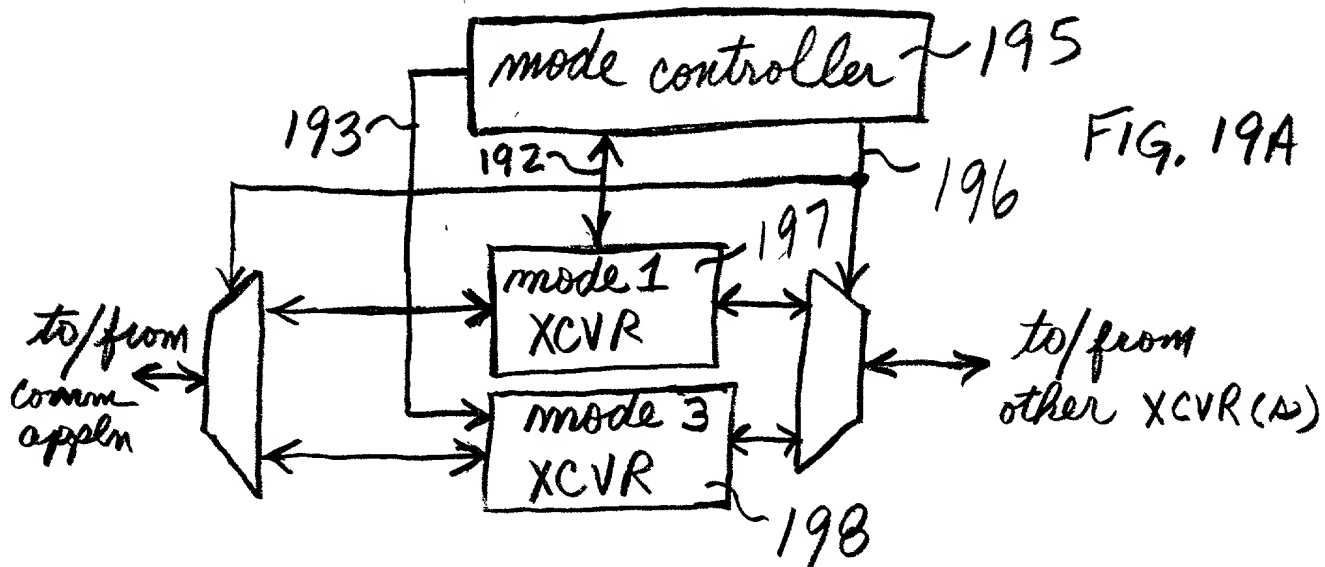


Figure 19



Preamble 4 bits	Access Code 64 bits
--------------------	------------------------

Figure 20

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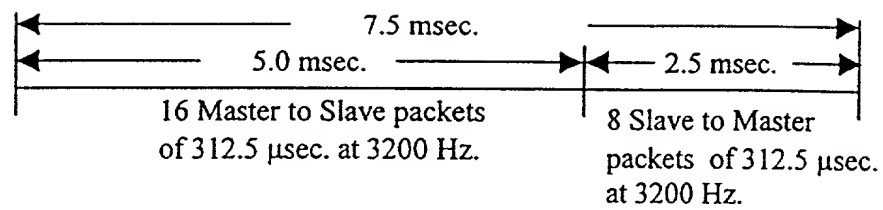


Figure 21

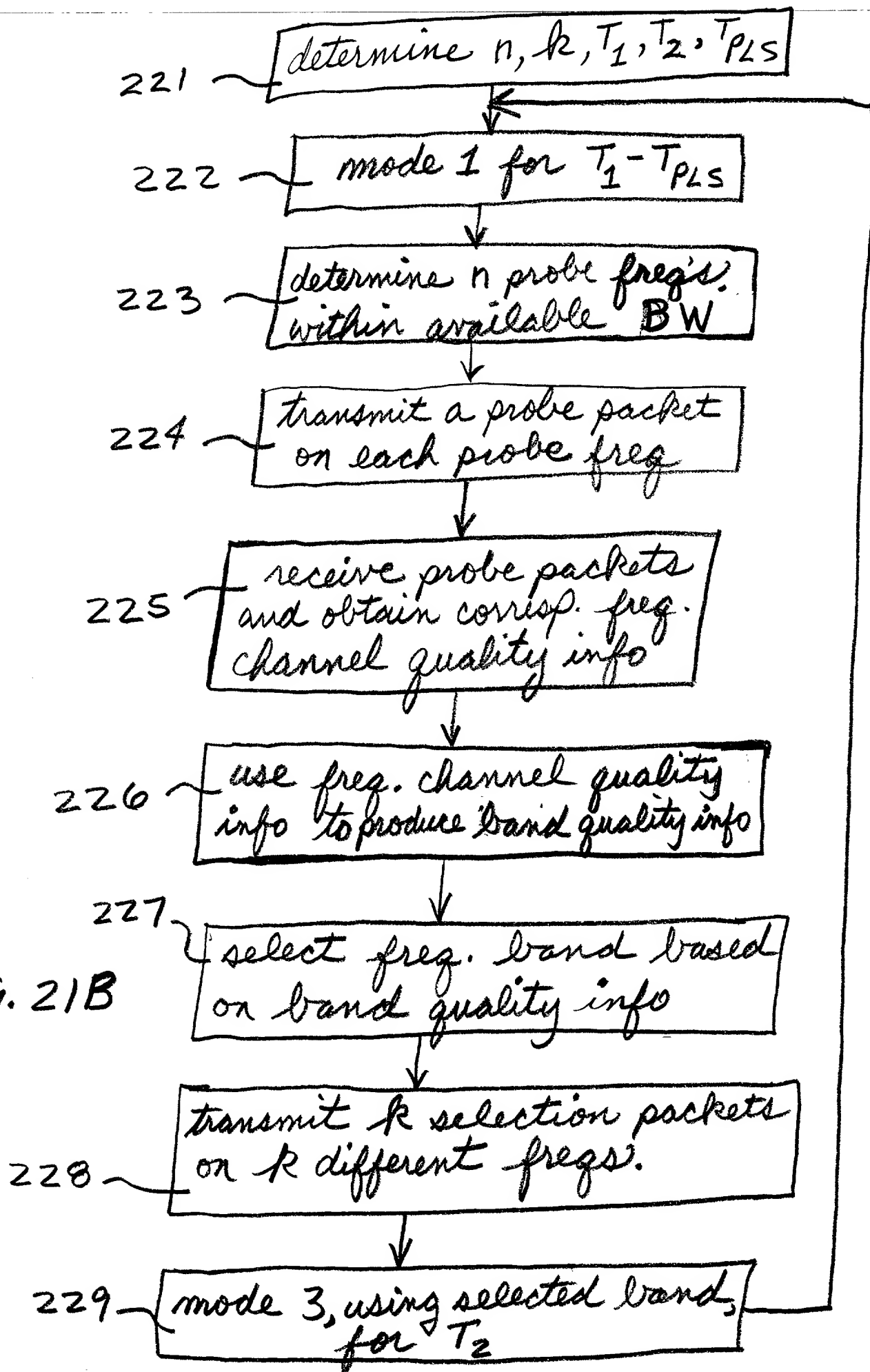


FIG. 21B

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Preamble 4 bits	Access Code 64 bits	Channel Edge Frequency Index $6 \times 3 = 18$ bits
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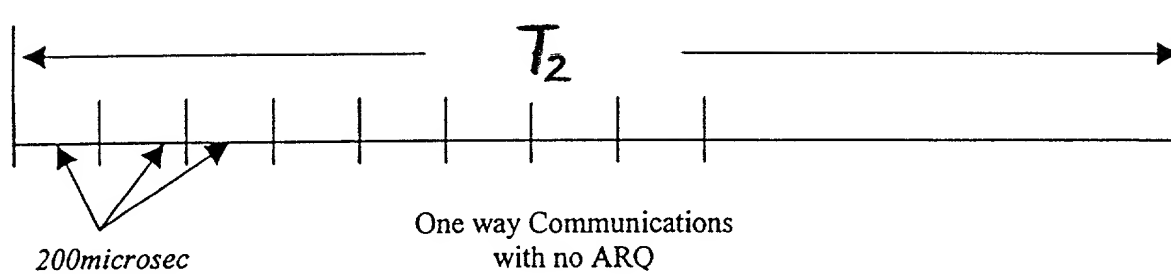
Figure 22

The figure consists of three vertically stacked plots showing the magnitude response of a 4th-order Butterworth low-pass filter. The x-axis for all plots is frequency in MHz, ranging from 0 to 80. The y-axis is magnitude in dB, ranging from -40 to 0.

- Top Plot:** Shows the 'Actual response' (solid line) and 'sampled response' (asterisks). The response is flat at 0 dB until approximately 30 MHz, then drops sharply to a minimum of about -30 dB at 50 MHz, and then rises back towards 0 dB.
- Middle Plot:** Shows the 'PLS' (Partial Least Squares) approximation. The response is flat at 0 dB until approximately 30 MHz, then drops sharply to a minimum of about -15 dB at 50 MHz, and then rises back towards 0 dB.
- Bottom Plot:** Shows the 'PLS' (Partial Least Squares) approximation. The response is flat at 0 dB until approximately 30 MHz, then drops sharply to a minimum of about -25 dB at 50 MHz, and then rises back towards 0 dB. A legend in the bottom right corner identifies the asterisks as the 'sampled response' and the solid line as the 'Actual response'.

Figure 23

Master to Slave



ARQ Packets from Slave to Master  
100  $\mu$ sec. in length.

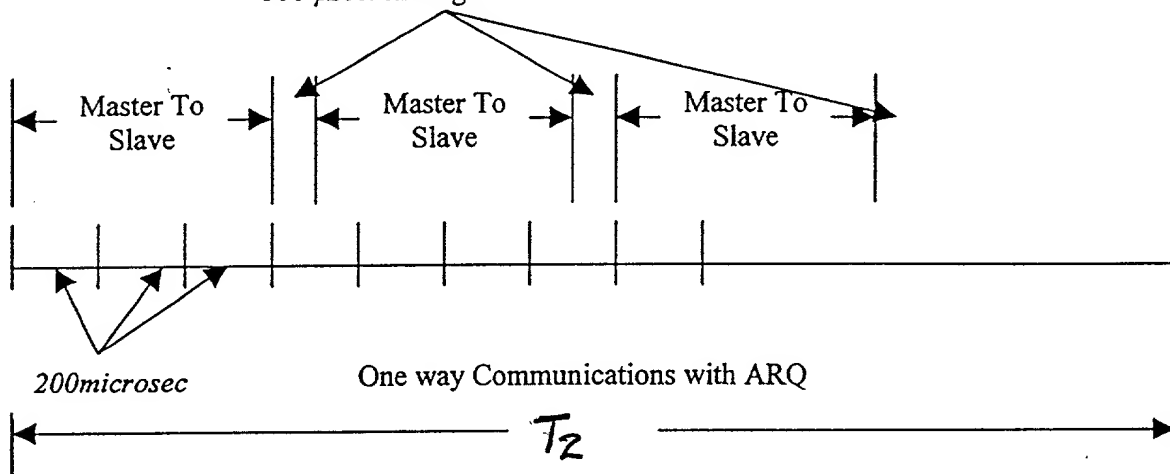


Figure 24



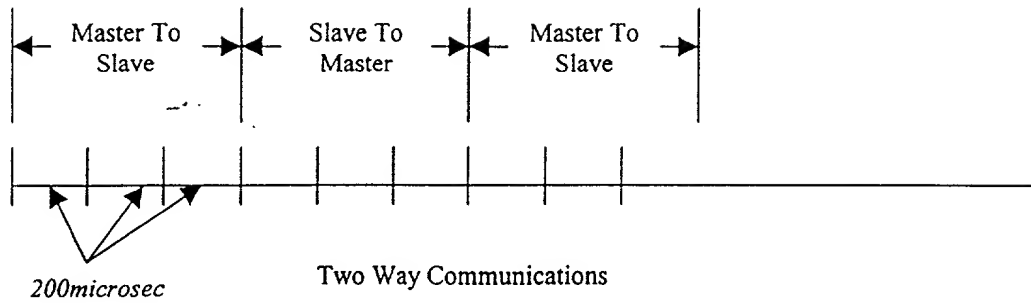


FIG. 24A

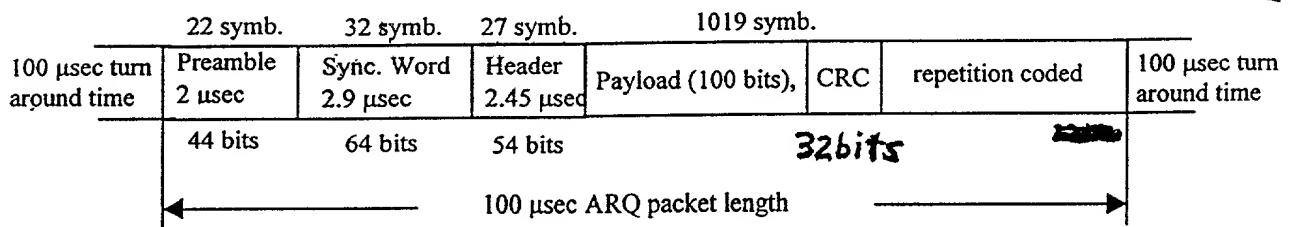


FIG. 25A

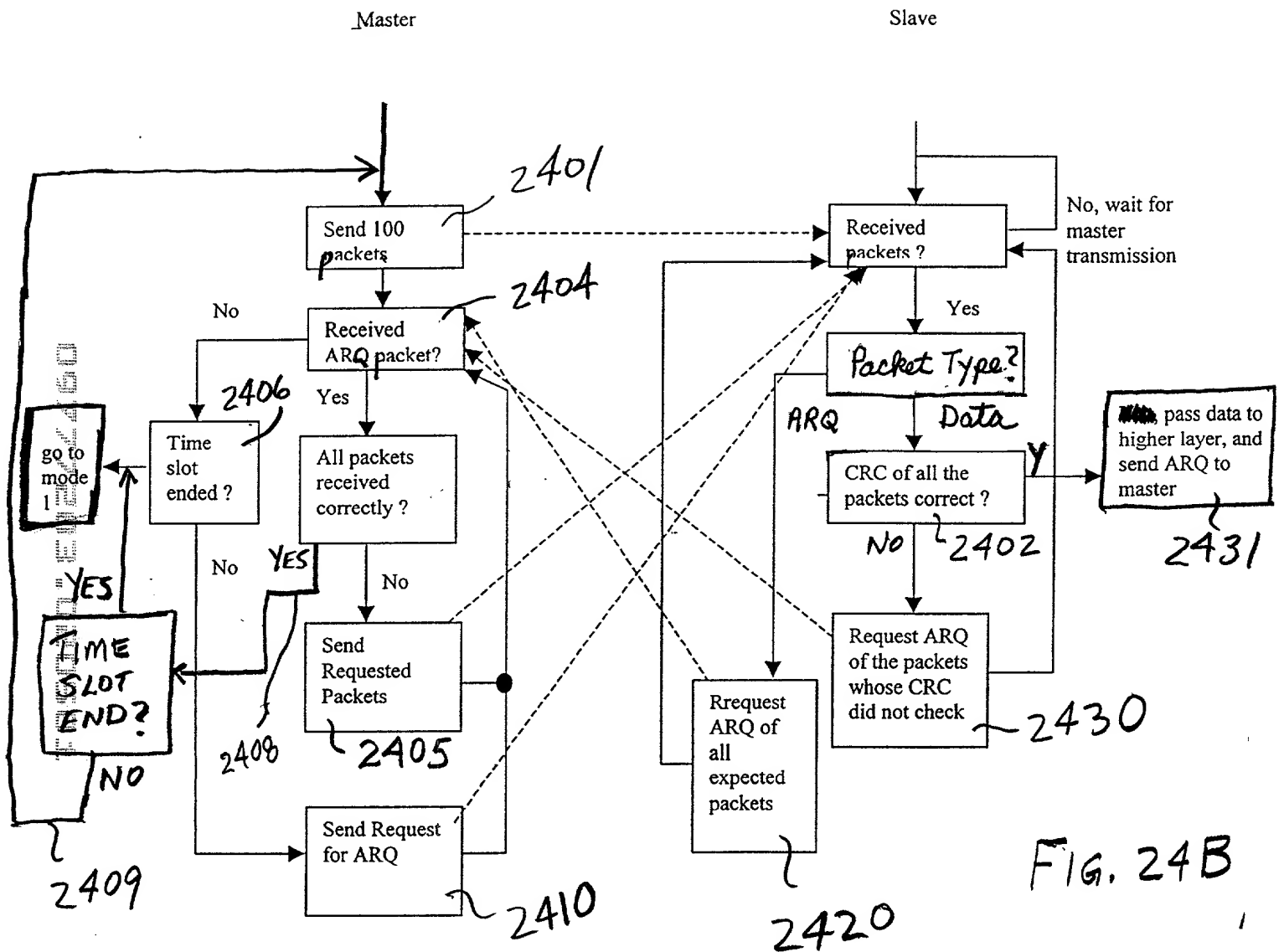


FIG. 24B

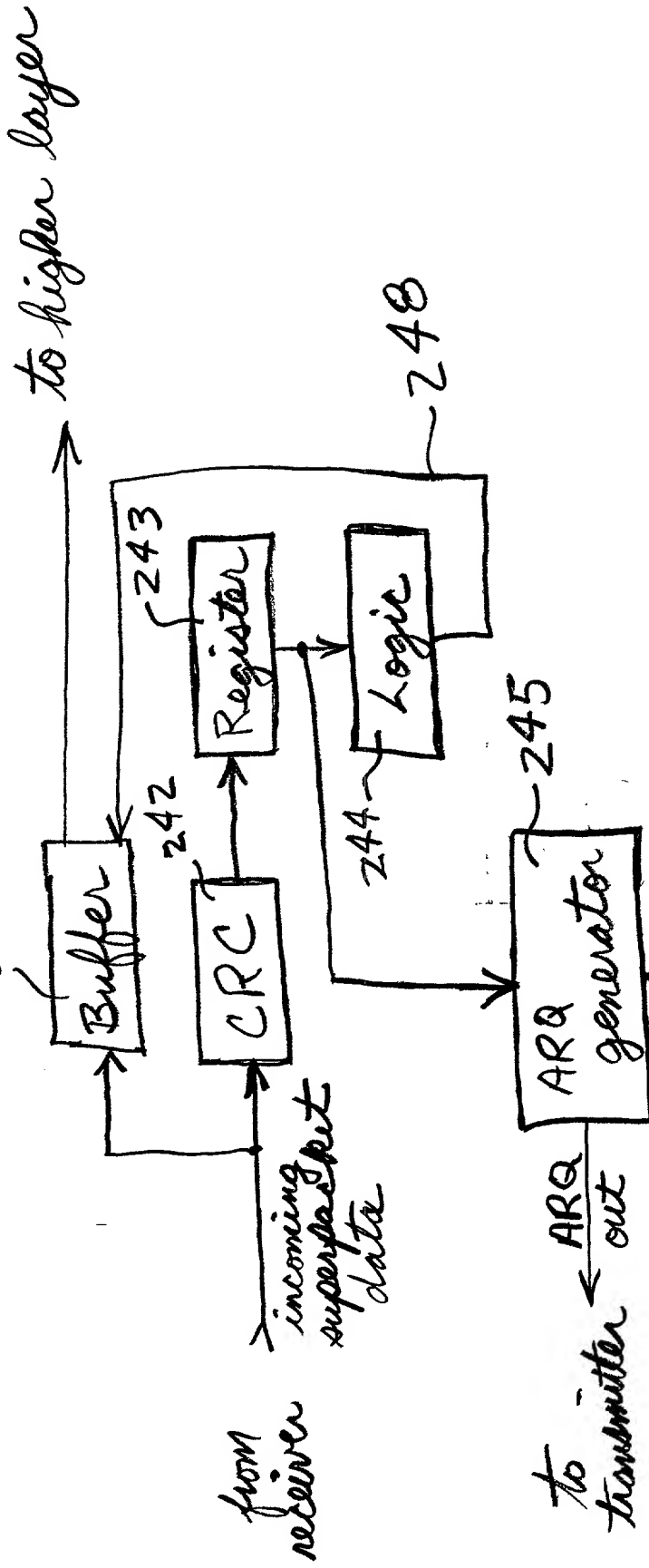
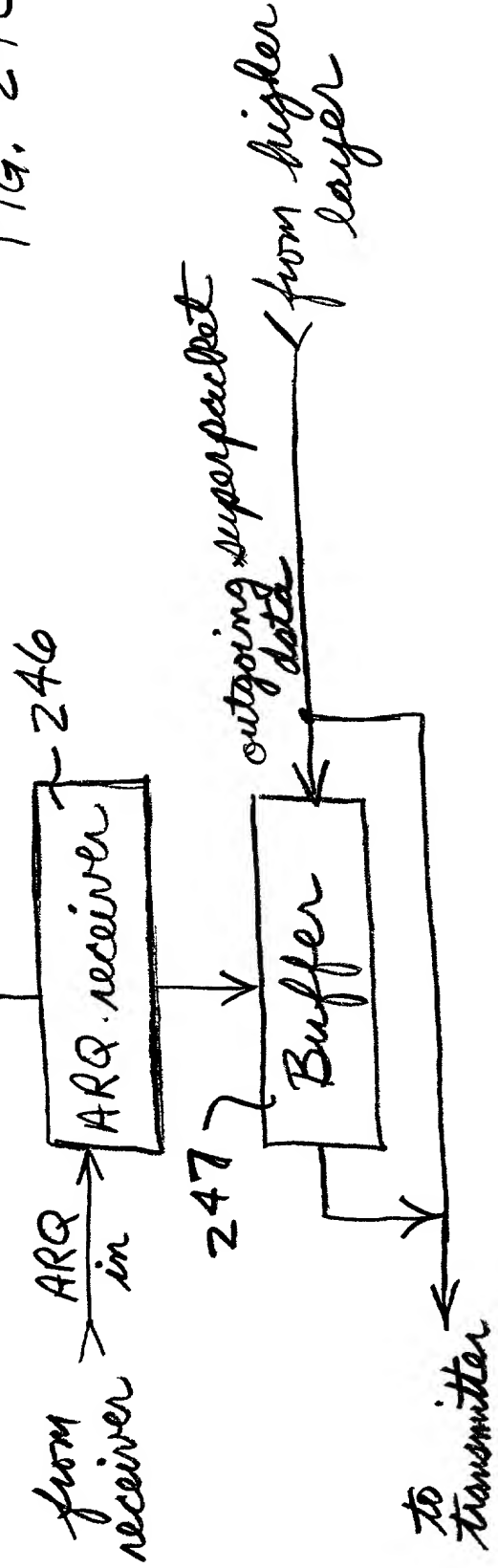


FIG. 24C



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T05020" E024460

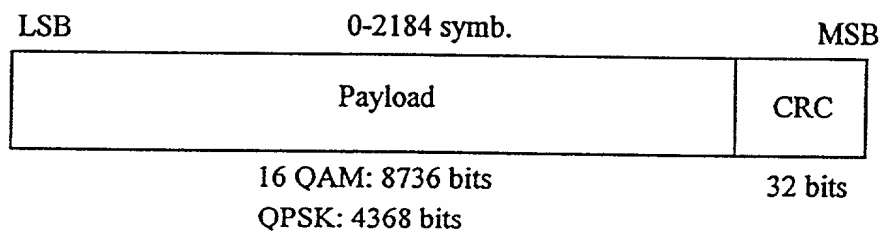


Figure 25

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22 symb.	32 symb.	27 symb.
Preamble	Sync. Word	Header
2 $\mu$ sec.	2.9 $\mu$ sec.	2.45 $\mu$ sec
44 bits	64 bits	54 bits

Figure 26

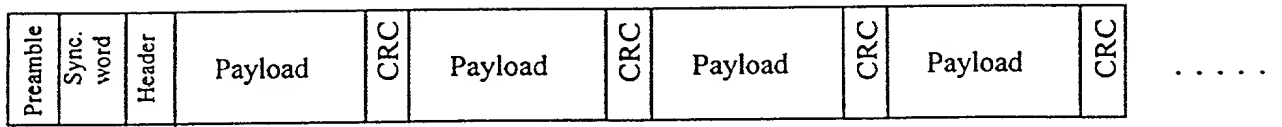


Figure 27

MPEG2 HDTV Video transmission using Mode 3	
Video data rate	18 Mbps
Video frames/sec	24
Video frames/Mode 3 slot	6
Mode 3 data rate	44 Mbps, 11 MSPS
Coding	Rate $\frac{1}{2}$ , Turbo
Modulation	16 QAM
Time in Bluetooth mode ( $T_1$ msec.)	25 msec.
Time in Bluetooth mode for other devices	17.5 msec.
Time in Bluetooth mode for PAL	7.5 msec.
Slot time in Mode 3 ( $T_2$ msec.)	225 msec.
Mode 3 packet size	4.4 Kbits
Data bits/packet	4368
CRC bits/packet	32
Mode 3 packet length	200 $\mu$ sec.
Number of packets/slot	1030
Length of training sequence	81 symbols, 7.36 $\mu$ sec.
Number of packets/training sequence	10
Number of packets/ARQ	100
Number of training sequences/packet	103
Time required to transmit video frames (no ARQ)	$204.5 + 1.5 + 0.76 = 206.76$ msec.
ARQ rate	9 %
Time required to transmit video frames with ARQ	225 msec.

Figure 28

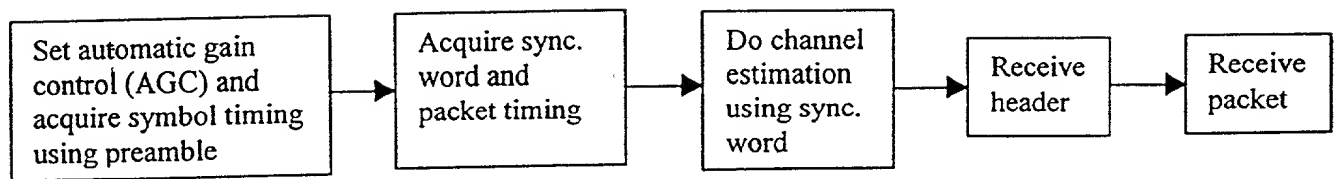


Figure 29



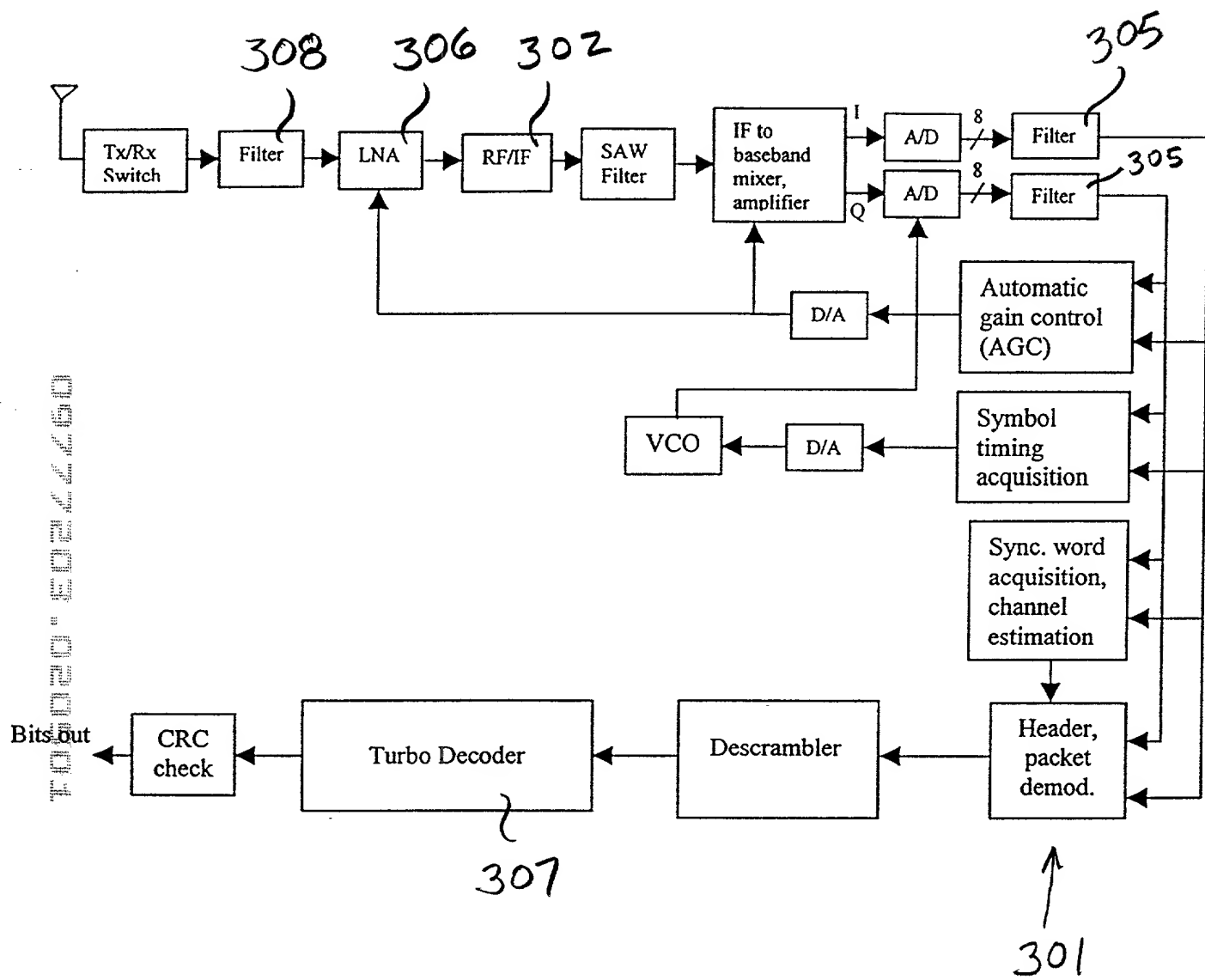


Figure 30

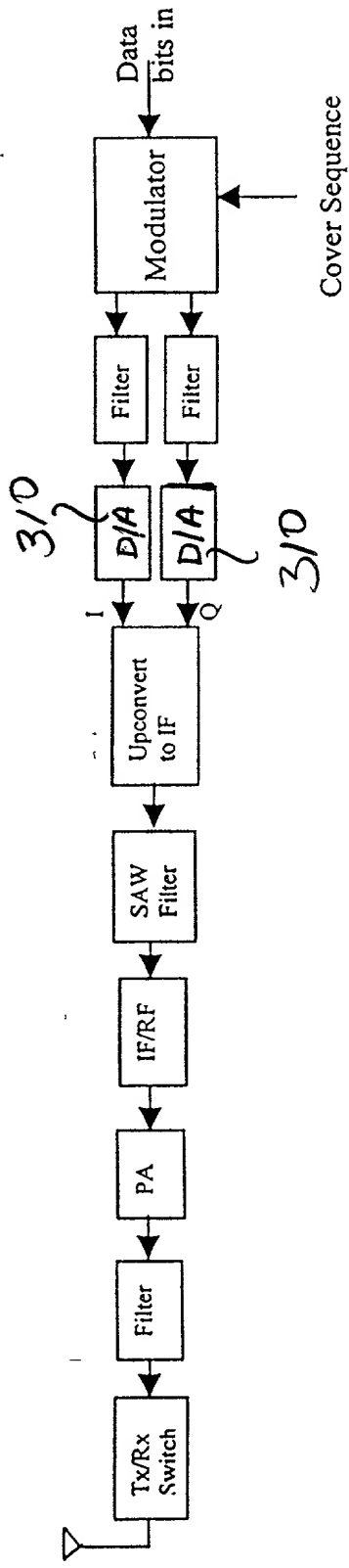


Figure 31

0977203-02501

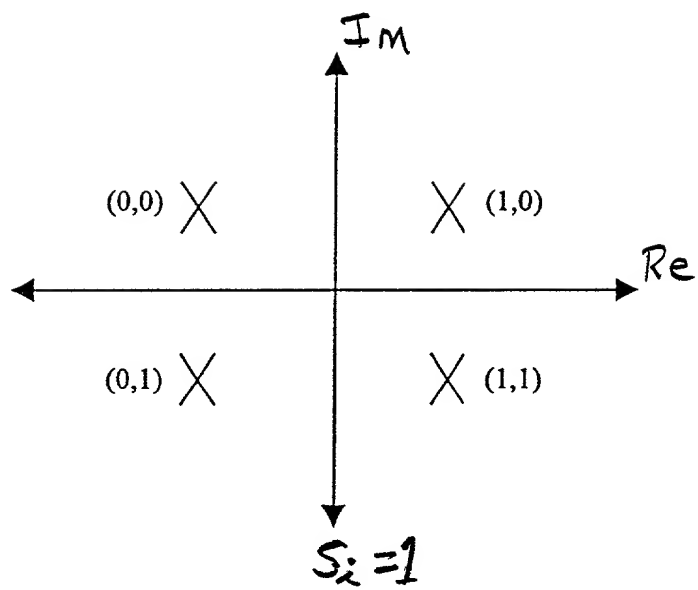
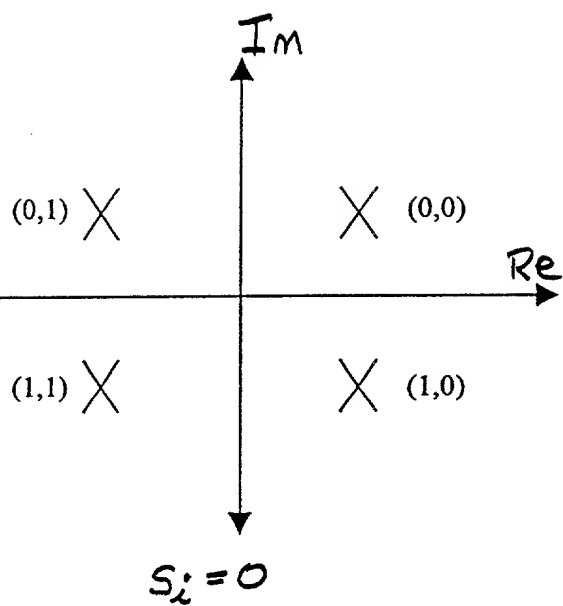


Figure 32

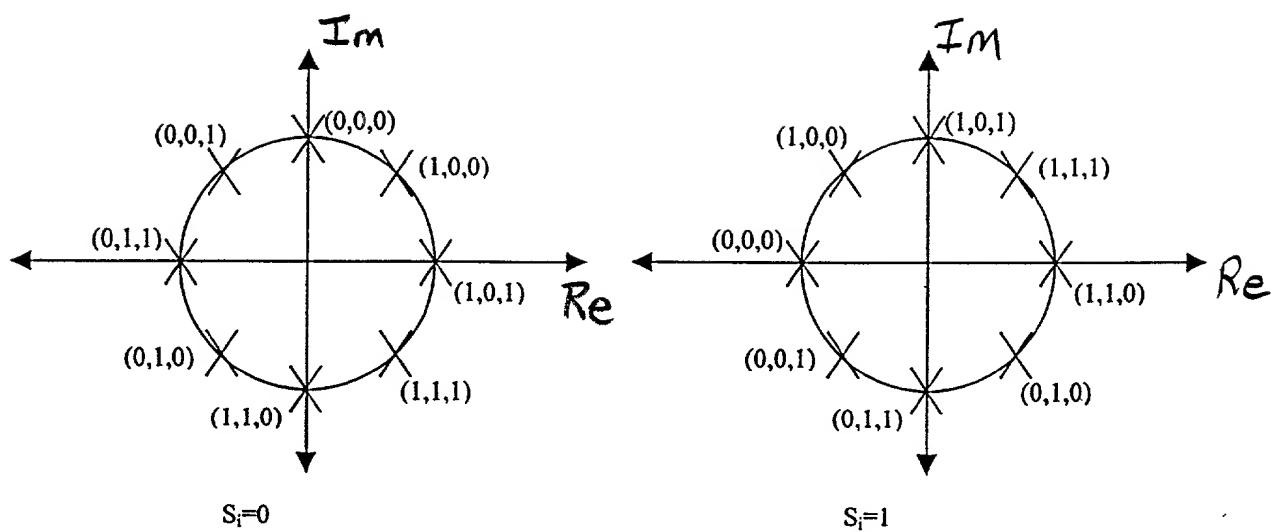


FIG. 32A

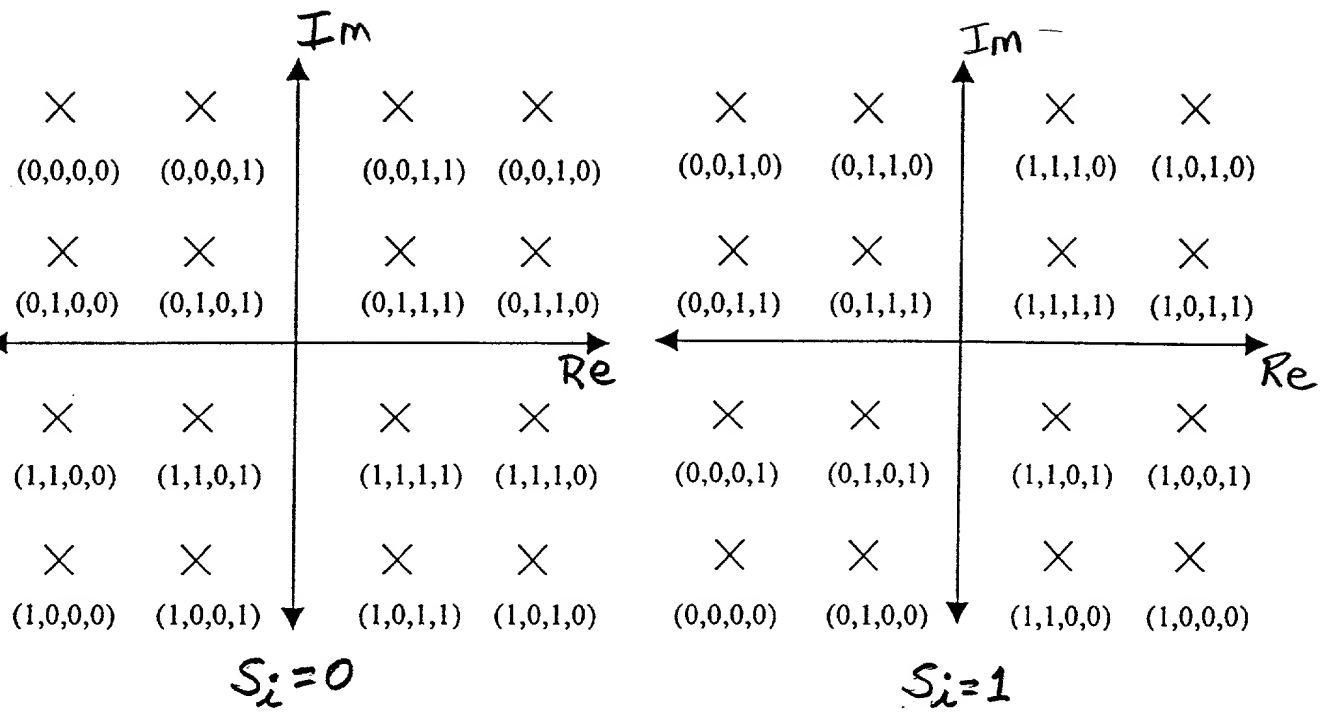


Figure 33

Figure 34

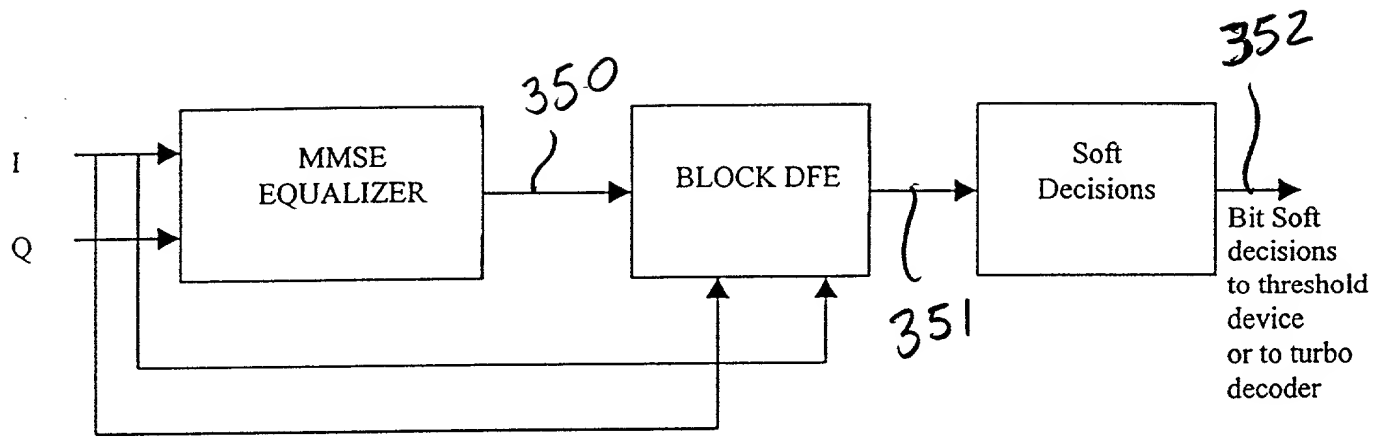


Figure 35

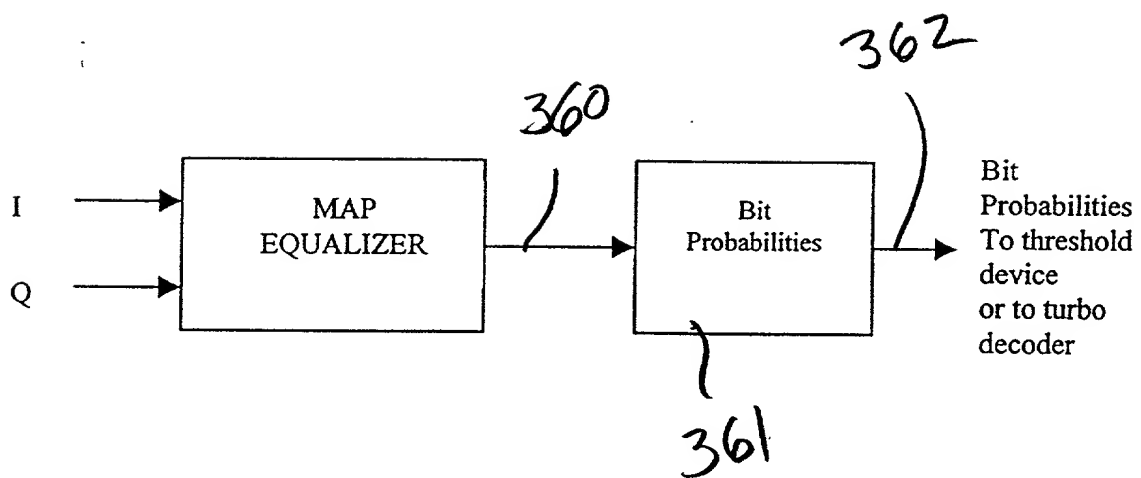


Figure 36



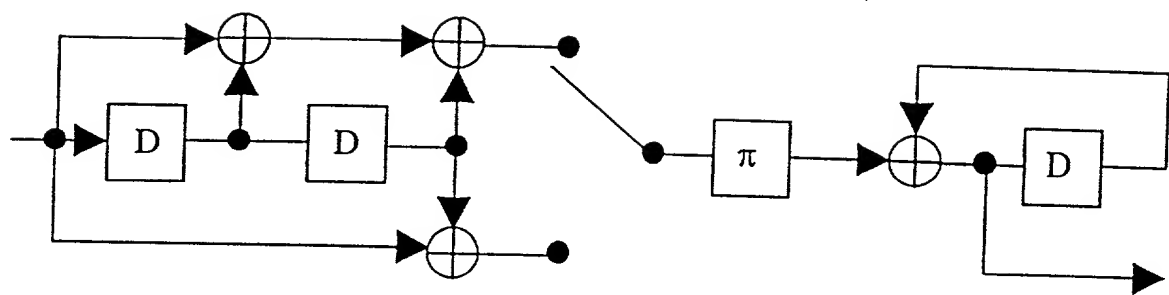


Figure 37

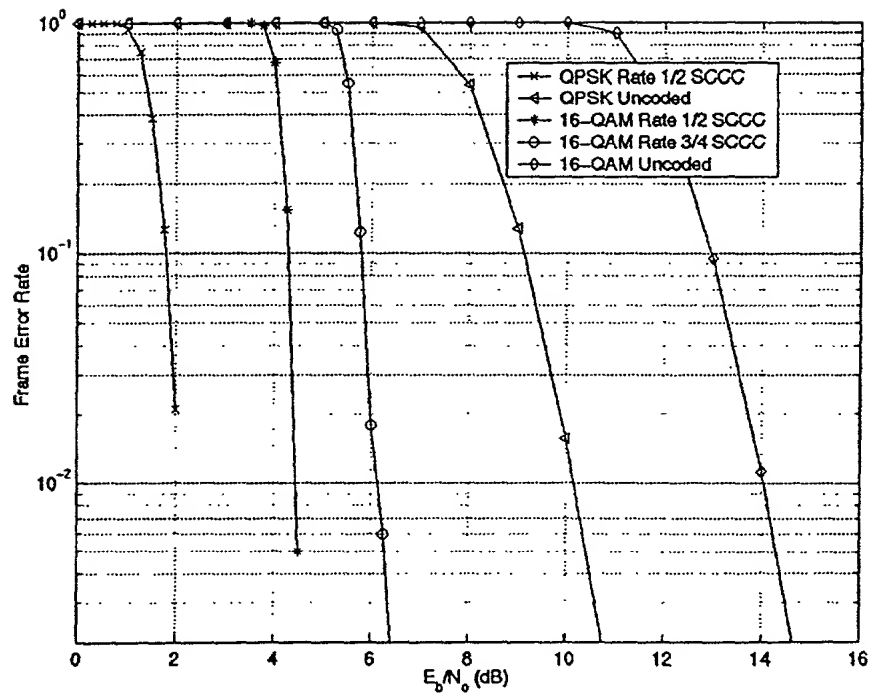


Figure 38

703020"6034460

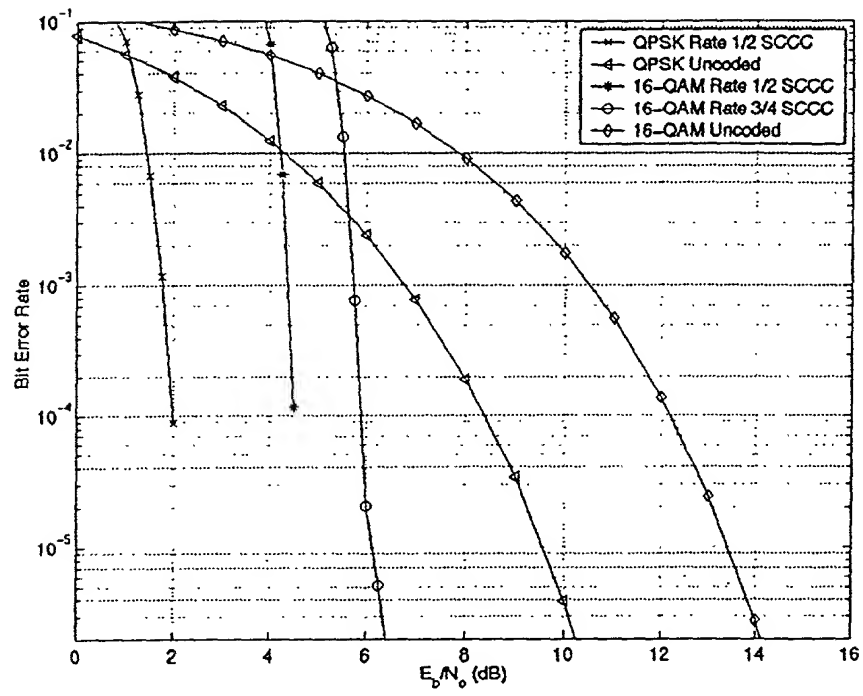


Figure 39

105020" 0022/60

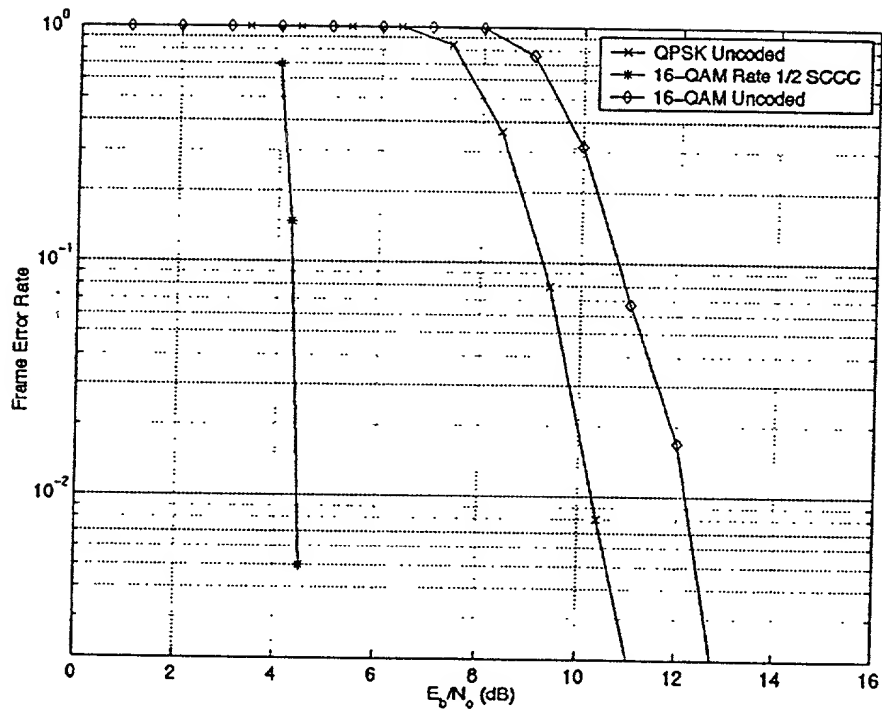


Figure 40

1.05020" 60347260

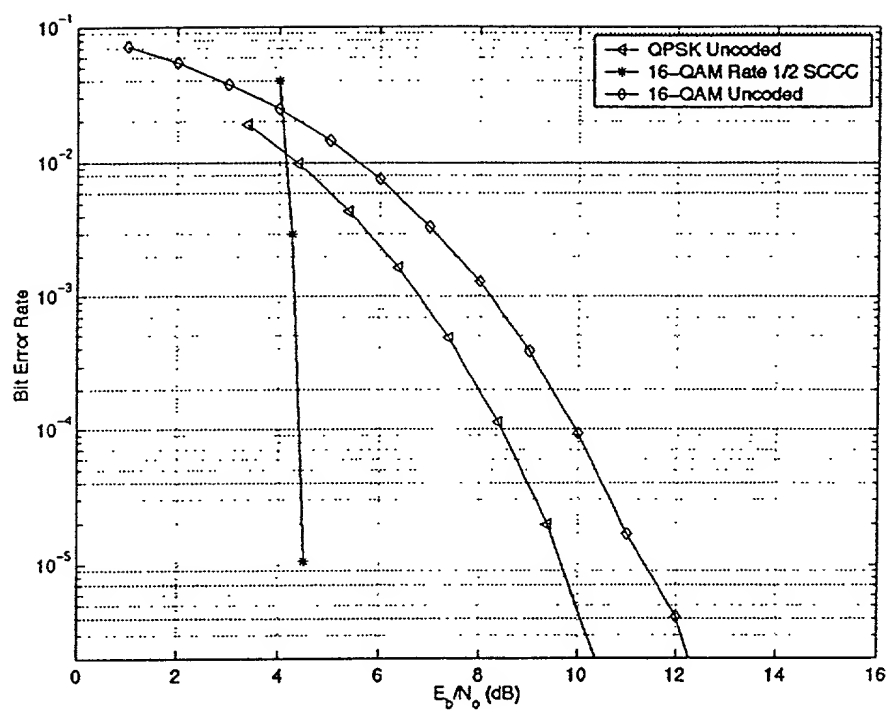


Figure 41

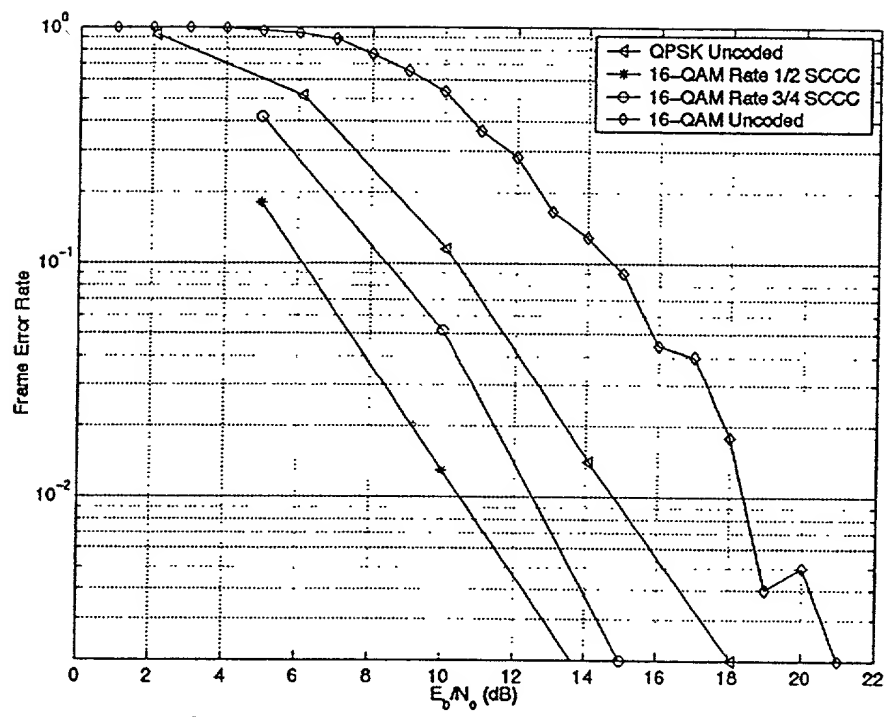


Figure 42

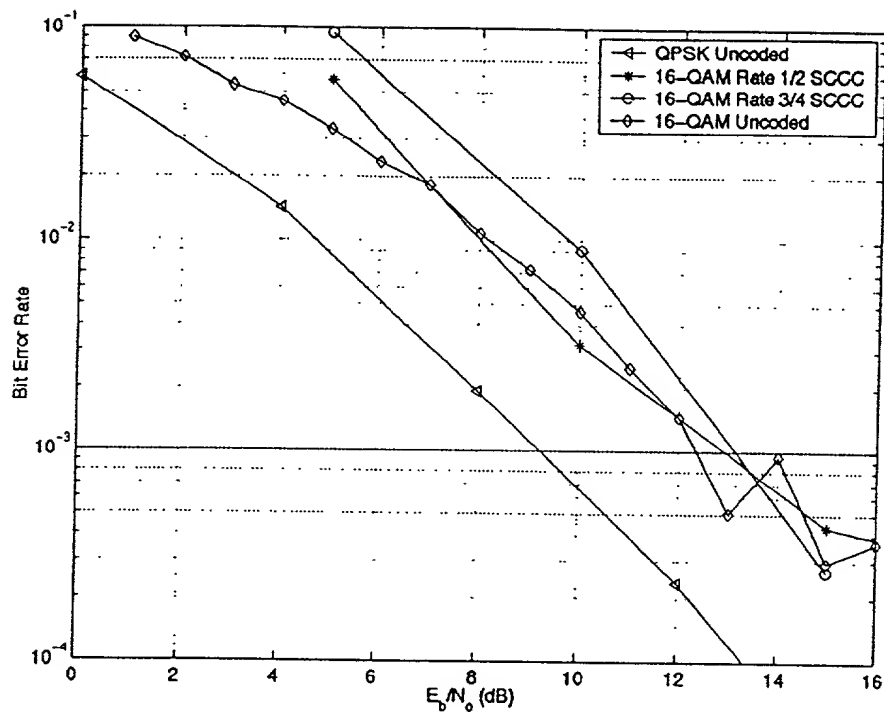


Figure 43

105020" E03/2/60

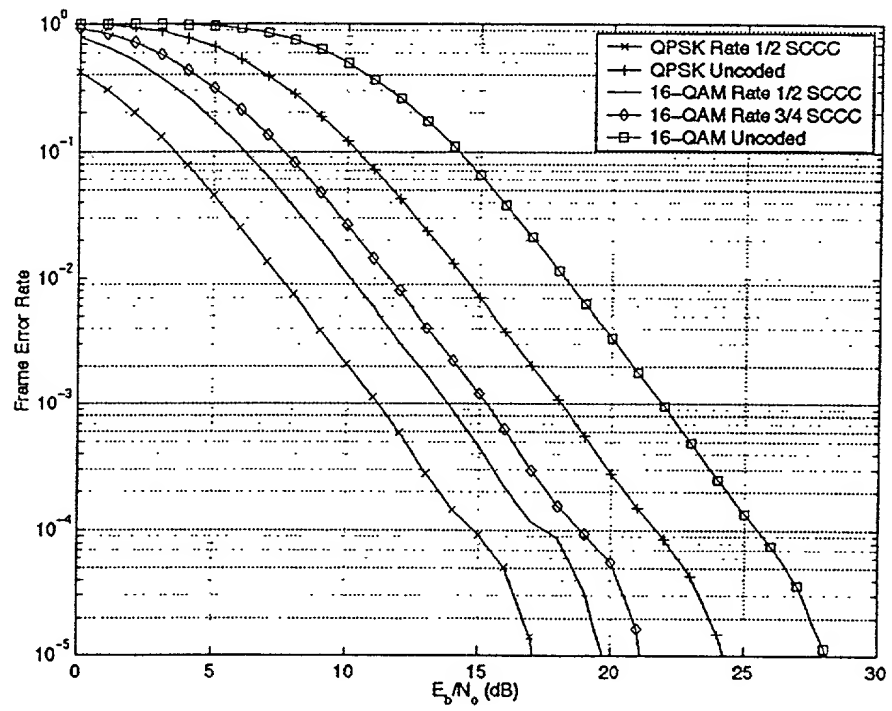


Figure 44